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Case Report

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Lung cancer in a welder; case report

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ABSTRACT

There are more than one million deaths due to lung cancer every year. Occupational exposure is thought to be responsible for 10% of lung cancer cases. A 51-year-old male patient applied to our clinic with complaints of weakness and rapid fatigue that have been going on for 1 month. In his professional history, it was learned that he has been working as welder for 24 years. On the thoracic computed tomography, a nodular lesion of approximately 5 cm in size with irregular borders and approximately 1.7 cm in size with irregular borders in the anterior left upper lobe, surrounding the hilar vascular structures, was observed in the left hilar region. On the PET-CT scan, there was intense metabolic activity uptake in interactions in cells. Biopsy taken from the endobronchial lesion detected in fiberoptic bronchoscopy was reported as adenocarcinoma. The International Agency for Research on Cancer (IARC), classifies carcinogens that cause cancer development in humans into 4 groups. Welding fume exposure in our case is in group 1 accoriding to IARC.Here, we presented a occupatşonal lung cancer case related to the welding fumes.

Keywords: Welding, pneumoconiosis, malignancy

INTRODUCTION

Cancer is a multifactorial disease with complex causes of development and an increasing incidence and mortality worldwide. It is believed that this condition is caused by an increase in the prevalence of cancer-predisposing conditions with the growth of the population, aging and socioeconomic developments. Occupational exposure is thought to be responsible for 10% of lung cancer cases. This is due to the fact that in many occupational risk factors, the essential route of exposure is via inhalation. At the same time, the synergistic effect of smoking also plays a critical role in cancer development.[1-3] The International Agency for Research on Cancer (IARC), an independent scientific organization within the World Health Organization, classifies carcinogens that cause cancer development in humans into 4 groups. Factors considered to be definitely carcinogenic in humans are included in Group 1.[4] Welding fume exposure in our case is in group 1 accoriding to IARC. Here, a 51-year-old welder diagnosed as lung cancer is presented.

CASE REPORT

A 51-year-old male patient applied to our clinic with complaints of weakness and rapid fatigue that have been going on for 1 month. He has never smoked a cigarette. There was no history of cancer in his family. On physical examination, his general condition was good, vital signs were stable, respiratory sounds were heard normally during the chest examination. Laboratory values at the time of application were within normal limits. In his occupational history, it was learned that he has been working as a welder for 24 years, and exposed to mixture of welding fumes. Posteroanterior chest radiograph showed homogenous opacity in the left hilar area, 1.5 cm nodular density in the left upper zone, and a consolidated area in the left middle zone (**Figure 1**). On thoracic computed tomography, a soft tissue lesion with irregular margins, approximately 5 cm in size, surrounding the hilar vascular structures was observed in the left hilar region. In addition, a nodular lesion measuring approximately 1.7 cm with a partially irregular border was observed in the upper left lobe anterior (**Figure 2a, 2b**). On the PET-CT scan, pathological increased metabolic activity involvement was observed in the central soft tissue lesion of about 5 cm size in the left lung (SUVmax: 16.76). There was increased metabolic activity uptake in an irregularly circumscribed nodular density increase of approximately 1.7 cm in the anterior upper lobe of the left lung (SUVmax: 6.17) (**Figure 3**). No extrapulmonary involvement was observed on PET-CT. Endobronchial lesion was observed in the patient who underwent fiberoptic bronchoscopy. The biopsy taken from the lesion was reported as adenocarcinoma (**Figure 4**). Chemotherapy (Alectinib) was started by the Oncology Department for the patient who had a positive Alk mutation. The patient evaluated by the clinical council of occupational diseases was accepted as occupational lung cancer with his current occupational history, clinical and radiological findings, and his legal notification was made.

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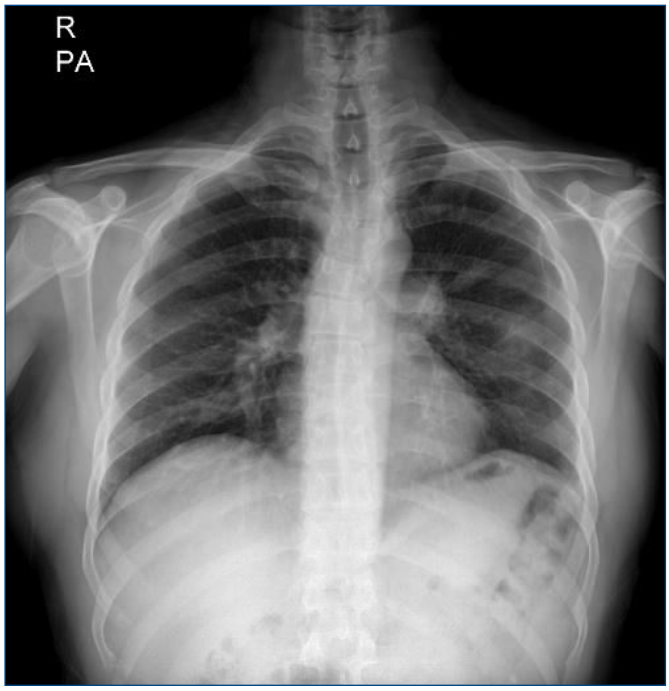

Figure-1: Chest X ray showed homogenous opacity in the left hilar area, 1.5 cm nodular density in the left upper zone, and a consolidated area in the left middle zone

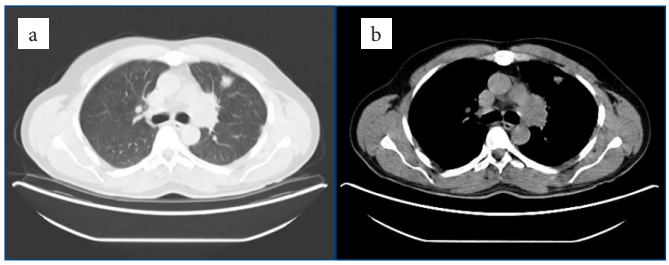

Figure-2: a, b On thoracic computed tomography, a soft tissue lesion with irregular margins, approximately 5 cm in size, surrounding the hilar vascular structures was observed in the left hilar region. In addition, a nodular lesion measuring approximately 1.7 cm with a partially irregular border was observed in the upper left lobe anterior

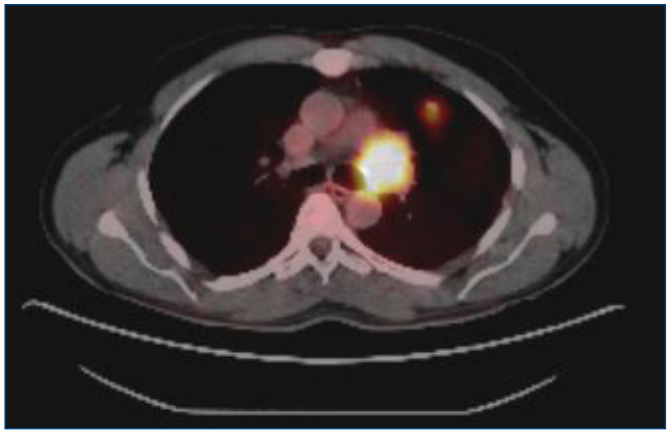

Figure-3: On the PET-CT scan, pathological increased metabolic activity involvement was observed in the central soft tissue lesion of about 5 cm size in the left lung(SUVmax: 16.76). There was increased metabolic activity uptake in an irregularly circumscribed nodular density increase of approximately 1.7 cm in the anterior upper lobe of the left lung(SUVmax: 6.17)

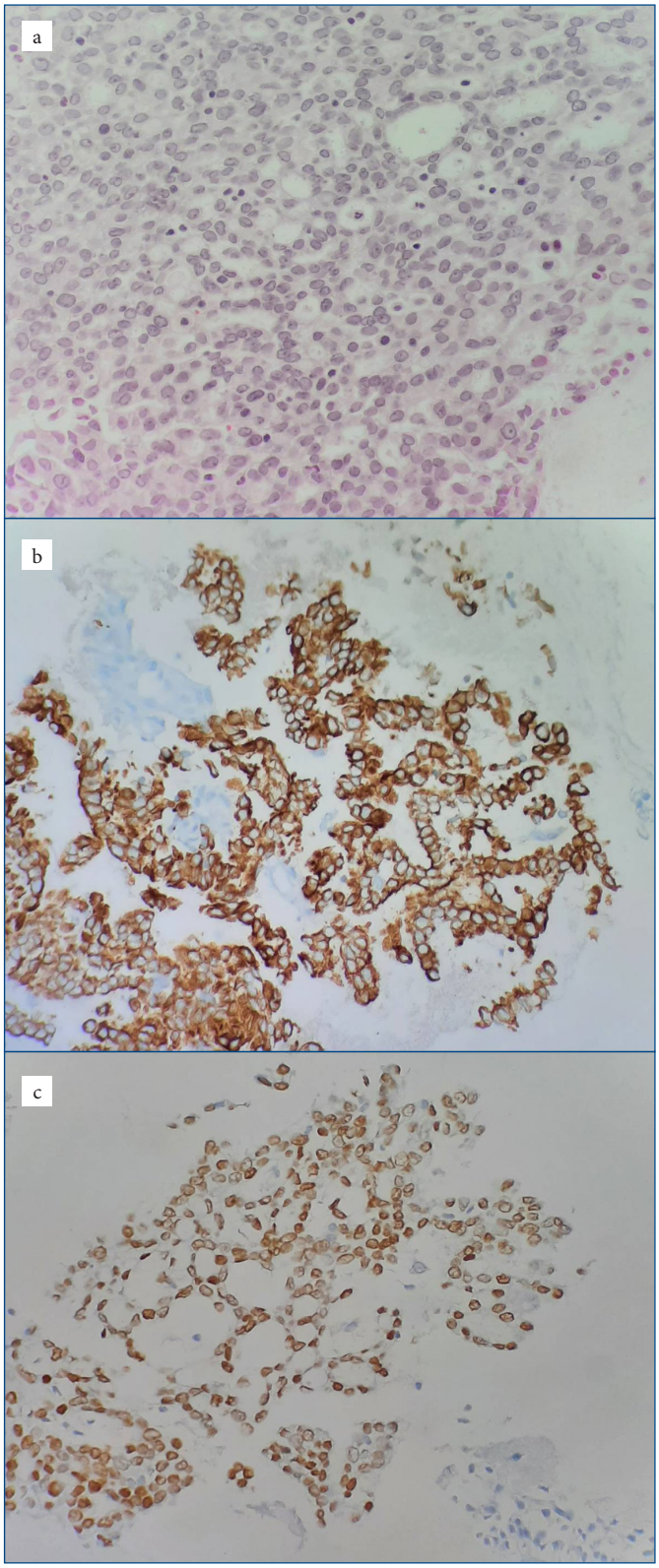

Figure-4: a Tumor cells forming a cribriform structure (HEX400)
b Keratin 7 positivity in tumor cells (Keratin 7X400)
c TTF1 positivity in tumor cells (TTF1X400)

DISCUSSION

5-10% of cancer development is explained by hereditary mechanisms, and the remaining part is attributed to the environmental and occupational factors.[5] Large cohort studies have proven the relationship between smoking and lung cancer.[6,7] The development of lung cancer in smokers is about 20%. Aproximately 90% of patients with lung cancer were also smoker.[8,9] Familial cancer syndromes are considered rare, and the majority of cancers occur sporadically.[5] Our case had never smoked and had no family history of cancer. Millions of workers in Turkey and around the world are exposed to welding fumes, which are composed of complex substances and rich in metals. Welding fumes refer to all kinds of fumes generated during the joining or cutting of metals with various welding techniques.[4] There are various welding techniques, the most common being arc welding where an arc between the filler metal and the work is the heat source (such

as Shielded metal arc welding, tungsten inert gas welding) and gas welding where energy is provided. The composition of the fumes depends on the nature of the filler metals, powders, combustibles, electrodes and electrode coatings, in addition to welding techniques.[4,10,11] The size of the weld particles formed as a result of the welding process varies between 10 nm and 20 mm depending on the process, and approximately 90% of them are smaller than 2 microns. Therefore, it can easily reached to respiratory tract.[11,12] According to the results of the IARC review, welding fumes have been identified as the definitive human carcinogen.[4] The carcinogenic feature of welding fumes have been thought as suppressing the immune system and causing chronic inflammation.[13] Solid tumors that are thought to be caused by exposure to occupational carcinogens in humans appear to develop cancer about 10-12 years or more after exposure. Cancers originating from the blood and lymphatic system, such as leukemia and lymphoma, are usually seen 3-7 years after exposure to occupational carcinogens. Hematological cancers that grow more slowly (e.g. myelodysplasia or low-grade lymphomas), on the other hand, may occur later.14 In 2006, Ambroise er al.[15] designed a meta-analysis of 66 epidemiological studies, they found that the risk of lung cancer was 26% higher in welders. Hospital-based studies in Argentina in 1999 and Finland in 2005 reported an increased risk of squamous cell carcinoma among workers exposed to welding fumes.[16,17] Paris et al.[18] reported an increased risk of adenocarcinoma among workers exposed to welding fumes in a hospital-based study in France in 2006. Our case, who had no smoking history and no family history of cancer, had a diagnosis of lung adenocarcinoma that developed 24 years after the onset of welding fumes exposure. In a case where causality and temporal relationship between cancer diagnosis and exposure were established, a legal notification was made by diagnosing occupational lung cancer.

CONCLUSION

As a result, the possibility of lung cancer should be kept in mind in the follow-up of those exposed to welding fumes, since the risk of lung cancer increases in relation to welding fumes exposure in welders.

ETHICAL DECLARATIONS

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

REFERENCES

1. Omran AR. The epidemiologic transition: a theory of the epidemiology of population change. 1971. *Milbank Q.* 2005;83(4):731-757. doi:10.1111/j.1468-0009.2005.00398.x
2. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries.. *CA Cancer J Clin.* 2018;68(6):394-424. doi:10.3322/caac.21492
3. Gersten O, Wilmoth JR. The cancer transition in Japan since 1951. *Demogr Res.* 2002;7:271-306. doi:10.4054/DemRes.2002.7.5
4. IARC. (2019). Agents Classified by the IARC Monographs Volumes 1–127. Accessed: 06 July 2020, http://monographs.iarc.fr/ENG/Classification/index.php
5. Fischman M. L., Rugo H. S. Occupational Cancer. LaDou J., Harri-son R. (Ed.). Current Occupational & Environmental Medicine 5th edition New York, N.Y.: McGraw-Hill Education LLC. 2014;276-307
6. Doll R, Peto R. Mortality in relation to smoking: 20 years' observations on male British doctors. *Br Med J.* 1976;2(6051):1525-1536. doi:10.1136/bmj.2.6051.1525
7. Rogot E, Murray JL. Smoking and causes of death among U.S. veterans: 16 years of observation. *Public Health Rep.* 1980;95(3):213-222.
8. Wright GS, Gruidl ME. Early detection and prevention of lung cancer. *Curr Opin Oncol.* 2000;12(2):143-148. doi:10.1097/00001622-200003000-00008
9. Ozlü T, Bülbül Y, Oztuna F, Can G. Time course from first symptom to the treatment of lung cancer in the Eastern Black Sea Region of Turkey. *Med Princ Pract.* 2004;13(4):211-214. doi:10.1159/000078318
10. Antonini JM. Health effects of welding. *Crit Rev Toxicol.* 2003;33(1):61-103. doi:10.1080/713611032
11. Burgess, W. A. Welding. Pp. in W. A. Burgess, ed. Recognition of health hazards in industry: a review of materials and processes, 2nd ed. Wiley, New York. 1995;167-204
12. Jenkins NT, Pierce WMG, Eagar TW. Particle size distribution of gas metal and flux cored arc welding fumes. *Welding J.* 2005;84(10):156-163.
13. Guyton KZ, Rusyn I, Chiu WA, et al. Application of the key characteristics of carcinogens in cancer hazard identification. *Carcinogenesis.* 2018;39(4):614-622. doi:10.1093/carcin/bgy031
14. LaDou, J., & Harrison, R. (Eds.). Current occupational & environmental medicine. New York: McGraw-Hill. 2021;392
15. Ambroise D, Wild P, Moulin JJ. Update of a meta-analysis on lung cancer and welding. *Scand J Work Environ Health.* 2006;32(1):22-31. doi:10.5271/sjweh.973
16. Pezzotto SM, Poletto L. Occupation and histopathology of lung cancer: A case-control study in Rosario, Argentina. *Am J Ind Med.* 1999;36(4):437-443. doi:10.1002/(sici)1097-0274(199910)36:4<437::aid-ajim4>3.0.co;2-c
17. Alkjær T, Pilegaard M, Bakke M, Jensen BR. Danish National Research Centre for the Working Environment Norwegian National Institute of Occupational Health Finnish Institute of Occupational Health. *Scand J Work Environ Health*. 2005;31(2):152-159.
18. Paris C, Clement-Duchene C, Vignaud JM, et al. Relationships between lung adenocarcinoma and gender, age, smoking and occupational risk factors: A case-case study. *Lung Cancer.* 2010;68(2):146-153. doi:10.1016/j.lungcan.2009.06.007